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JOHN A. SMART
708 BLOSSOM HILL RD., #201
LOS GATOS, CA 95032-3503

EXAMINER
MORRISON, JAY A

ART UNIT	PAPER NUMBER
2168	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>22 October 2007</u>.
2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>1-70</u> is/are pending in the application.
    4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) <u>1-70</u> is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a) ☐ All   b) ☐ Some * c) ☐ None of:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____.
      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____ .
4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____ .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/22/07 has been entered.

Remarks

2.   Claims 1-15, 17-40 and 42-70 are pending.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 1-15, 17-40 and 42-70 are rejected under 35 U.S.C. 103(a) as being

unpatentable over <u>Srivastava et al.</u> ('<u>Srivastava</u>' hereinafter) ('Optimizing Multi-Join

Queries in Parallel Relational Databases', In Proceedings of the Second International

Conference of Parallel and Distributed Information Systems, Los Alamitos, California,

USA, December 1993) in view of <u>Lu</u> (Patent Number 7,047,530).

        As per claim 1, <u>Srivastava</u> teaches

        In a database system, a method for parallel optimization of a query, the method

comprising: (see abstract)

        generating a plurality of parallel plans for obtaining data requested by the query,

the parallel plans including parallel operators for executing portions of the query in

parallel; (query plan space, section 4.1, page 87, first paragraph)

        adjusting parallel operators of each parallel plan if necessary; (for each tree and

all subtrees, section 4.1, page 87, first paragraph; note that 'if' denotes an optionally

recited limitation and optionally recited limitations are not guaranteed to take place and

are therefore not required to be taught, see MPEP § 2106 Section II(C))

        creating a schedule for each parallel plan indicating a sequence for execution of

operators of each parallel plan, wherein the schedule is created based upon

dependencies among operators of each parallel plan (ordered tree where shape

represents intra-operator parallelism, section 2, page 85, first paragraph) and resources

available for executing the query; (query optimization considers resources available,

section 6, page 91, first paragraph)

determining execution cost of each parallel plan based on its schedule.

(combining operator costs, section 3.2, page 87)

and returning a result of a particular parallel plan having lowest execution cost for obtaining data requested by the query. (query plan representation for expressing intra and inter-operator parallelism, processor and memory assignment, and execution time estimate, section 6, page 91, first paragraph)

Srivastava does not explicitly indicate "based on maximum number of threads available for executing the query, wherein said maximum number of threads is user configurable".

However, Lu discloses "based on maximum number of threads available for executing the query, wherein said maximum number of threads is user configurable" (maximum number of threads, column 6, lines 23-27; maximum threads configured appropriately, column 8, lines 5-9; column 15, lines 25-32).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Srivastava and Lu because using the steps of "based on maximum number of threads available for executing the query, wherein said maximum number of threads is user configurable" would have given those skilled in the art the tools to improve the invention by allow parallel compilation using makefiles. This gives the user the advantage of being able to control aspects of the compilations via the makefile.

As per claim 2,

Srivastava does not explicitly indicate "the query comprises a Structured Query Language (SQL) expression".

However, Lu discloses "the query comprises a Structured Query Language (SQL) expression" (column 3, lines 3-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Srivastava and Lu because using the steps of "the query comprises a Structured Query Language (SQL) expression" would have given those skilled in the art the tools to improve the invention by allowing the use of standardized query structures. This gives the user the advantage of being able to leverage their experience in use of these common structures.

As per claim 3, Srivastava teaches

said generating step includes generating an operator tree for each parallel plan based on the query. (section 4.1, page 87, first paragraph)

As per claim 4, Srivastava teaches

said step of generating an operator tree includes generating nodes of the operator tree as iterators for applying predefined behavior to data. (section 4.1.1, page 88, figure 5)

As per claim 5, Srivastava teaches

said step of generating an operator tree includes inserting a parallel operator in the operator tree. (section 2, page 85, second paragraph)

As per claim 6, <u>Srivastava</u> teaches

said step of generating an operator tree includes dividing a query operation into sub-tasks and said parallel operator provides for executing said sub-tasks in parallel. (section 2, page 85, first paragraph; figure 1)

As per claim 7, <u>Srivastava</u> teaches

said parallel operator provides for executing said sub-tasks in parallel across a plurality of storage units. (section 6, page 91, first paragraph)

As per claim 8, <u>Srivastava</u> teaches

said parallel operator provides for executing said sub-tasks in parallel across a plurality of CPUs. (section 6, page 91, first paragraph)

As per claim 9, <u>Srivastava</u> teaches

said parallel operator provides for pipelining of intermediate results from a first set of operators to a second set of operators. (section 1, page 84, third paragraph)

As per claim 10, <u>Srivastava</u> teaches

said generating step includes generating a parallel plan using a partitioning property so as to partition data among operators of the parallel plan. (section 3.1, page 86, third paragraph)

As per claim 11, <u>Srivastava</u> teaches

said generating step includes generating a cost vector for each parallel plan. (section 3.1, page 86, first paragraph)

As per claim 12, <u>Srivastava</u> teaches

said cost vector includes as components a selected one or more of work done by a processor in a given time, execution time of an operator in the parallel plan, and resource usage of an operator in the parallel plan for a certain time period. (section 3.1, page 86, second paragraph)

As per claim 13, <u>Srivastava</u> teaches

said generating step further comprises: pruning a first parallel plan having a cost vector costing more in each vector dimension than a second parallel plan. (section 3.1, page 86, second pagragraph)

As per claim 14, <u>Srivastava</u> teaches

said generating step includes generating a plurality of parallel plans based at least in part on partitioning and multi-dimensional costing. (section 3.2, page 87, first paragraph)

As per claim 15, <u>Srivastava</u> teaches

said adjusting step includes adjusting a parallel plan based on maximum number of threads available at compile time. (section 4.1.2, pages 88-89, fourth paragraph)

As per claim 17, <u>Srivastava</u> teaches

said step of adjusting parallel operators of each parallel plan further comprises: adjusting parallel operators based on available memory resources. (section 6, page 91, first paragraph)

As per claim 18, <u>Srivastava</u> teaches

said creating step includes separating a resource intensive operator into a plurality of operators. (section 4.1.2, page 88, section paragraph)

As per claim 19, <u>Srivastava</u> teaches

said creating step includes identifying pipelines in each parallel plan. (section 1, page 84, third paragraph)

As per claim 20, <u>Srivastava</u> teaches

said creating step includes constructing a pipeline dependency tree based on dependencies among operators of each parallel plan. (section 3.2, page 87, second paragraph)

As per claim 21, <u>Srivastava</u> teaches

said creating step includes determining order of execution of pipelines based on the pipeline dependency tree and available resources. (section 3.2.1, page 87, first paragraph)

As per claim 22, <u>Srivastava</u> teaches

if resource usage of a particular pipeline is greater than resources available for the particular pipeline, splitting the particular pipeline into a plurality of pipelines. ('if' denotes an optionally recited limitation and optionally recited limitations are not guaranteed to take place and are therefore not required to be taught, see MPEP § 2106 Section II(C))

As per claim 23, <u>Srivastava</u> teaches

said step of splitting the particular pipeline includes adding operators for materializing the particular pipeline into a plurality of pipelines at intervals such that resource usage is evenly distributed over the plurality of pipelines. (section 3.2.1, page 87, first paragraph)

As per claim 24, <u>Srivastava</u> teaches

A computer-readable medium having processor-executable instructions for

performing the method of claim 1. (see abstract, section 6, page 91, first paragraph)

As per claim 25, <u>Srivastava</u> teaches

A downloadable set of processor-executable instructions for performing the

method of claim 1. (see abstract, section 6, page 91, first paragraph)

As per claims 26-40 and 42-47,

These claims are rejected on grounds corresponding to the arguments given

above for rejected claims 1-15 and 18-23 and are similarly rejected.

As per claims 48-68,

These claims are rejected on grounds corresponding to the arguments given

above for rejected claims 1-15,17-23 and are similarly rejected.

As per claim 69, <u>Srivastava</u> teaches

A computer-readable medium having processor-executable instructions for

performing the method of claim 48. (abstract, section 6, page 91, first paragraph)

As per claim 70, <u>Srivastava</u> teaches

A downloadable set of processor-executable instructions for performing the method of claim 48. (abstract, section 6, page 91, first paragraph)

Response to Arguments

5.   Applicant's arguments with respect to claims 1-15, 17-40 and 42-70 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6.   The prior art made of record, listed on form PTO-892, and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jay A. Morrison whose telephone number is (571) 272-7112. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Vo can be reached on (571) 272-3642. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TIM VO
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

Jay Morrison
TC2100

Tim Vo
TC2100